

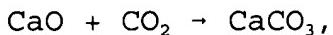
REMARKS

In the Office Action, claims 1-8 were rejected under 35 USC §112, second paragraph. Claims 1-3 were rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Aylen et al. Claims 1-3 were rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Van Mao. Claims 1-3 were rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Hollingsworth. Claims 1-3 were rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Judd. Claims 1-3 were rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over JP 55099992. Claims 1-3 were rejected under 35 USC §103(a) as being unpatentable over DE 2706077.

One of the aims and the advantages of the present invention as described and claimed is that the fertilizer contains a source of calcium in the *chemical form of* calcium oxide (CaO), instead of other more common and more stable forms such as calcium carbonate ( $\text{CaCO}_3$ ). Indeed, plants will assimilate calcium oxide more rapidly (from within a few hours to a few days) than calcium carbonate (need of several days to weeks). This is the reason why in the specification it is pointed out, that the product according to the invention contains at least 20 % by weight of quicklime (see

top of page 2 and also claim 1): quicklime can be defined as calcium oxide (CaO), containing few impurities.

This quicklime (or calcium oxide) is very reactive towards carbon dioxide ( $\text{CO}_2$ ) and is very easily transformed into calcium carbonate even at room temperature, according to the reaction



so that it is not easy to deliver the product as calcium oxide. It is the reason why in the specification it is also pointed out, that the carbon dioxide present within the calcium and magnesium ameliorator is below 4% (see top of page 2 and claim 2). Actually, it means that the major part of the magnesium and, moreover of the calcium, is NOT in the form of carbonate, such as  $\text{CaCO}_3$ , but of oxide, such as CaO.

Thus, when in the specification or in the claims it is mentioned a maximal content of  $\text{CO}_2$ , it is a way to express a maximal content of **carbonate**. For instance, a content of  $\text{CO}_2$  of 4%, actually means, in the case of calcium, a content of  $\text{CaCO}_3$  of 9% (according to the chemical reaction above), but there is no  $\text{CO}_2$  as such, in the product.

Calcium oxide also reacts easily with water, even at room temperature, to form calcium hydroxide ( $\text{Ca(OH)}_2$ ). This  $\text{Ca(OH)}_2$  is a fine powdered solid, usually fully below 500  $\mu\text{m}$ . In its turn,

$\text{Ca(OH)}_2$  will react with the  $\text{CO}_2$  of the atmosphere, to produce calcium carbonate  $\text{CaCO}_3$ .

Following the same reasoning as above with  $\text{CO}_2$ , it happens often that the calcium content of a chemical component is expressed as "CaO", even if the chemical form of this component is not true "calcium oxide". For instance, a content of 9 % of  $\text{CaCO}_3$ , as said above, can be expressed as 5 % of CaO, even if the true chemical component is  $\text{CaCO}_3$  and not CaO. This way of expressing calcium compounds was not used in the present application, but very often in the prior documents cited by the Examiner.

Aylen et al. deals with a fertilizer in the chemical form of urea, characterized in the fact that it is non-friable and shows anti-caking properties. To obtain this effect, an inorganic material, containing calcium is added. This **additive** can be calcium oxide or hydroxide but also cement or even fly ash. If the first two additives are used, the hardness of the final material will come from the carbonation of those additives according to the chemical equation above. So the final form of the additive will be calcium carbonate  $\text{CaCO}_3$ , and no more "true" CaO.

The additive is such called because it is added in "only small quantities" (col. 4, 1.51), so that "the amount of additive and/or impurities cannot exceed 0.95 %" of the fertilizer (col. 7, 1. 34,35); "with the most preferred range of 0.25 % to 0.75 %" (col. 7, 1. 37,38). The prior document is very far from the present

invention, which claims more than 20 % of calcium oxide (as such, excluding other forms of calcium). Moreover, the calcium used in the additive cannot be considered as a nutrient, like in the present invention.

Finally, it must be noted that the nitrogen contained in urea is not assimilated by plants as such; it has first to be transformed in nitrates by special enzymes, called urease. This is not the case of the diammonium phosphate used in the present invention, which is quickly used as such by plants as a source of nitrogen.

For all these reasons, Aylen et al. cannot be considered as anticipating the claimed invention.

Van Mao deals with an inert material used to enhance the water-retention capacity of soil; this inert material is as chryso-zeolites, the main component (35 to 60 % by weight) of which is  $\text{SiO}_2$  (silica). In this case, the calcium mainly comes from an ion exchange of sodium ( $\text{Na}$ ) by calcium, which is introduced as a calcium chloride ( $\text{CaCl}_2$ ) (aqueous) solution in the complex preparation method (see examples 3 and 4, following examples 1 or 2). During this exchange, a washing (with water or an aqueous solution) is carried out, so that the calcium might not be as  $\text{CaO}$ . Indeed, if  $\text{CaO}$  is present at one moment, it will react with the water of the washing (at  $120^\circ\text{C}$ , like in the example) to produce calcium hydroxide  $\text{Ca(OH)}_2$ , always under a powdered form.

Then, the calcium content of the final product of Van Mao, is expressed as  $\text{CaCO}_3$ , but can actually NOT be as a true oxide. Moreover, as said above, calcium hydroxide will have the tendency to react with  $\text{CO}_2$  of the ambient air to from  $\text{CaCO}_3$ , especially when calcium hydroxide is fine. On the other hand, the size "larger than 17 angstroms" in claim 1, does not concern the particle size but the pore size.

So, Van Mao does not anticipate the claimed invention, because he teaches about calcium probably present as fine calcium hydroxide  $\text{Ca}(\text{OH})_2$  (and surely not a coarse ( $>2$  mm) calcium oxide), in combination with a large amount of silica zeolite, which is an inert material without any nutrient effect. The calcium component cannot be considered as a nutrient. An ammonia compound can be present as a source of nitrogen in the Van Mao product, but there is no possibility to prepare a real fertilizer with calcium oxide, nitrogen, potassium and phosphorus, as coarse particles and with varying proportions, like in the present invention.

For all these reasons, the enhancer for water retention capability of soils, according to the complex process of Van Mao, appears to be far from the fertilizer of the claimed invention.

In Hollingsworth et al. calcium oxide is strangely mentioned at the same level as other components, which are all carbonates. Actually, the examples only refer to limestone (calcium carbonate) the role of which is explained as the foaming effect,

when the carbonate loses its CO<sub>2</sub> (see example 1, col.3, 1.46 "foamed by the escaped gas") in the "melt", which will later "solidify". Examples 2-6 explicitly cite the "carbonate" (col. 4, 1.6 and 1.7). Again in the claims, only carbonates are mentioned. In any case, the calcium component cannot be considered as a nutrient.

Hollingsworth teaches equally the use of other carbonates than calcium carbonate, like sodium carbonate or bicarbonate. In the latter cases, no effect is expected on plants. It is not recognized in this complex process of manufacturing a fertilizer, the product properties of the present application.

In Judd, the calcium and/or magnesium containing material, like kiln dust, incorporated in the composition is mainly as an oxide or hydroxide. To deal with the oxides, water is added "to hydrate the calcium or magnesium oxides" (see col. 1, 1.45-47). By doing so, nearly no calcium oxide will remain, because of the easy and quick chemical reaction with water to form calcium hydroxide (Ca(OH)<sub>2</sub>). So it is impossible to have more than 20% of calcium oxide (CaO), like in the present invention.

Moreover, the "hydrated dusts" are then pelletized and the hardening of the pellets is reached by carbonation of a major part (up to 98 %) of the calcium hydroxide, which means that the major chemical composition of the pellets will be calcium carbonate (CaCO<sub>3</sub>), as far as the calcium is concerned (see col. 1, 1.49-50). As already hereabove mentioned, plants do not easily assimilate

calcium carbonate, so that the present invention claims a composition where the calcium is present as calcium oxide. The calcium component is not considered as a nutrient but as a way to harden pellets according to this document.

Even if Judd claims at least 2 % of CaO or Ca(OH)<sub>2</sub>, it is NOT possible since the product according to this described process contains more than 20% of calcium oxide CaO. It appears that the major part of the calcium will be as carbonate, the remaining as hydroxide. In this way, Judd does not anticipate the present invention.

According to the two abstracts of JP 55099992, this document deals with a soil conditioner made partially of a by-product (slag), the composition of which will be variable, and of organic compounds, which are not very desirable for agricultural purpose, like in the present invention. This soil "modifier" must prevent the soil from hardening and from alkali troubles and is not dedicated to plant nutrition. The "additional fertilizing components" are added in very small quantities (less than 1 part for each), compared to 5 to 20 parts of the organic substances, 100 parts of slag, where 30 to 40 parts of silica and 35 to 45 parts of a calcium, expressed as CaCO. Again, the calcium in the slag is under various forms and phases and only expressed as CaCO. In any case, the calcium compounds are trapped within the slag. One can

understand the effect of the slag as soil conditioner but not as a nutrient. Plants cannot assimilate the calcium present in the slag.

This Japanese document cannot be considered as anticipating the present invention concerning a fertilizer, because the "soil conditioner" does not contain calcium under an assimilating form as true CaO and because of the low content of nitrogen phosphorus and potassium (less than 1 %, each).

DE 2706077 deals with the synthesis of PK fertilizer, from slag containing phosphorus. Calcium (and/or magnesium) carbonates, hydroxides or even oxides can be added to produce, with subsequent phosphoric acid  $H_3PO_4$ , dicalcium (and/or dimagnesium) phosphate. Before, during or after this addition of a Ca (and/or a Mg) compound, a (aqueous) solution of KCl is added, which is the "granulating" solution. Again, this complex way of preparing a fertilizer includes a step where water is added (with the KCl solution) to the calcium compound, so that, even if the calcium is initially added as calcium oxide, it will very quickly react with the water to produce calcium hydroxide. Water is for sure present during the granulation, as explained in examples 3 and 4, according to this document, where a drying of the water takes place.

Again, if calcium hydroxide is present, it will easily react with the  $CO_2$  of the atmosphere to produce calcium carbonate  $CaCO_3$ , which explains probably part of the hardening of the pellets. So this cited document teaches a complex process to

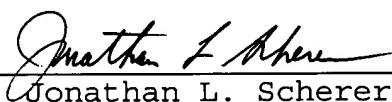
produce a fertilizer, where calcium will be present as Ca(OH)<sub>2</sub>, or CaCO<sub>3</sub>, but not as true CaO. In this way, this document does not anticipate the present invention.

Based on the foregoing amendments and remarks, it is respectfully submitted that the claims in the present application, as they now stand, patentably distinguish over the references cited and applied by the Examiner and are, therefore, in condition for allowance. A Notice of Allowance is in order, and such favorable action and reconsideration are respectfully requested.

However, if after reviewing the above amendments and remarks, the Examiner has any questions or comments, he is cordially invited to contact the undersigned attorneys.

Respectfully submitted,

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